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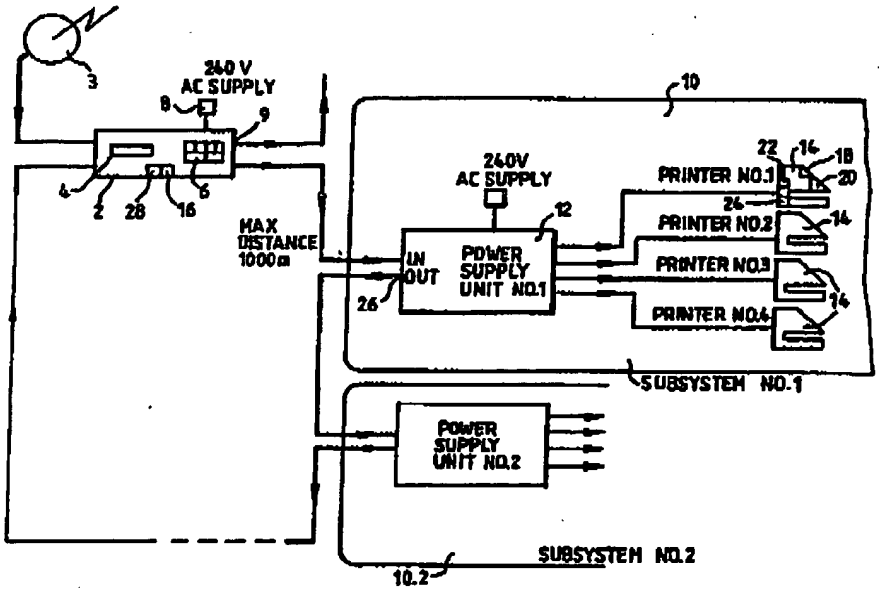

(57) Abstract

A time and date printing system is disclosed having a central electronic master clock (2) supplying clock pulses to subsystems (10) of groups of printers (14). Either the subsystems (10) or the printers (14) are coupled together in a daisy chain. The system enables a number of printers (14) to have accurate and guaranteed synchronised times as well as enabling the clock (2) to be sited remote from the printers (14) in a secure environment. A further embodiment is described and comprises a "standalone" arrangement but each of the "standalone" units share a common time source.

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TIME AND DATE PRINTING SYSTEM

This invention relates to a system for indicating and printing the time and date on a suitable ticket, label or strip.

Such equipment can be used for recording the time and date of an activity in car parks, betting shops, Customs and Excise operations, commodities and securities documentation and as a time clock to record attendance or other events at a factory or office.

Typically, such equipment as currently available comprises an electromechnical clock and a stamp mechanism with a through ribbon. In securities and commodities houses, this type of equipment often comprises one electromechanical clock, one print mechanism and one AC power source at each required location. Hence, a large dealing room might have a hundred or more individual electromechanical 'timestamps', each operating completely independently from its neighbours.

A problem with all such systems is mis-timing, whether arising gradually through time-drift or arising occasionally through interruption of the electrical supply, a malfunction or a similar disruption. No two

electromechanical 'timestamps' will drift in the same direction at exactly the same rate; during any power interruption the "timestamps" and their internal clocks stop and only resume when power returns - the lost time is not made up. Hence, it is necessary with such electromechanical 'timestamps' to check the clocks regularly and, if necessary to reset them to the correct time. This is a manual adjustment which is time consuming and has to be done frequently in the dealing rooms of commodities and securities houses.

It is therefore inevitable that these electromechanical 'timestamps' will not be either accurate or consistent.

This presents the problem that although the 'timestamp' is used to record the time of an event, if the time stamped bears little or no relation to the actual time of the event, then the 'timestamp' is not fulfilling its intention. In addition, from a security point of view there is also built-in a degree of inaccuracy which will occasionally give a dishonest representative the opportunity to reset a 'timestamp' for fraudulent purposes or use to his advantage a 'timestamp' with a known time discrepancy.

Furthermore, none of the systems known to date use

an intelligent clock which can detect the end of the month or year and change the 'timestamps' accordingly. Any adjustments that need to be made have to be done manually.

The present invention sets out to overcome these difficulties and to provide a time recording system which is accurate, consistent, secure, user-friendly and can communicate with any other system.

Accordingly to the present invention there is provided a system for printing the time and date comprising in combination:

a single means for generating an electronic clock pulse;

one or more power supplies each coupled to said clock pulse generating means; and

one or more print means each coupled to one of said power supplies.

There is no theoretical limit to the number of printers that can be operated, and, for example, in a dealing room often about fifty printers will be involved. Most preferably the printers are connected to their power supplies in groups, of up to ten printers per group. Thus, instead of an electromechanical unit having a clock, printer, and power supply on each desk

there is one central clock of electronic rather than electromechanical nature, the necessary processor to convert the signals into printer operating signals, and a plurality of printers arranged with a single power source common to each respective group of printers.

It will be apparent from the above that the opportunities for mis-timing, whether accidental or fraudulent, are minimised since the digital clock can be kept under tight security control and exactly uniform times will be recorded at all instances across the whole bank of printers.

The above embodiment lends itself particularly to use in a securities dealing room.

Embodiments of the invention will be further described with reference to the accompanying drawings, in which: -

Figure 1 is a block diagram of the system according to a preferred embodiment for a securities dealing room;

Figure 2 is a block diagram of the system according to a second embodiment;

Figure 3 is a block diagram of the system according

to a third 'standalone' embodiment;

Figure 4 is a block diagram of the master clock as illustrated in Figures 1 and 2; and

Figure 5 is a block diagram of the printer as illustrated in Figures 1 and 2.

The preferred embodiment of the system as illustrated in Figure 1 comprises a single master clock 2 being supplied by transmissions from the National Physical Laboratories atomic clock - MSF long-wave radio signal (- 60 KHz) in the U.K. The atomic clock is highly accurate and includes seasonal calender adjustments such as month changes, leap year changes and British Summer Time/Greenwich mean time changes.

The master clock receives the transmissions via a receiver 3 usually mounted on a rooftop in high noise locations or altenatively an antenna may be used. The master clock 2 includes an internal clock 4 for providing a back-up signal in case the transmissions are not received or when the atomic clock pulse is not available. In such instances, an external keypad 6 is provided for making any seasonal adjustments. Details of the master clock are illustrated in Figure 4.

Most European countries and the USA have a similiar standard atomic clock facility but often operating at different frequencies and coding. Alternatively, many post and telephone telecommunications (PTT's) and major TV networks produce a highly accurate time signal that can be accessed. Adustment to the master clock will be needed in order for the system to receive the appropriate clock pulses and the transmissions may be received via cable or phone or data lines where appropriate.

The master clock can be coupled to a back-up supply unit 8 if necessary to provide cover in case of mains power failure.

The master clock includes a number of outputs 9 driven via separate output buffers. These may be used to output signals in different formats and at different baud rates. Hence the master clock could also be interfaced with other systems which accept an external time code - eg. voice recorders, telephone management systems, time-zone wall displays, and computer processing systems. Hence, within a securities dealing room all written, verbal and computer records of a transaction could for the first time have a consistent, accurate time reference. This improves the audit trail of transactions through the operating systems and

greatly improves security.

The master clock is coupled to one or more subsystems 10.1, 10.2 etc. Preferably, the master clock is sited remote from each of the subsystems in a secure location. This enables access to the master clock to be highly controlled, reducing the risk of tampering with the clock thereby enhancing security. A cabling distance of 1000m between the master clock and the first subsystem will not affect the communication of the system, signal boosters (not shown) can be incorporated should there be problems with noise or attenuation.

Each subsystem comprises a power supply unit 12 and any number of printers 14. The printers 14 should be coupled to the power supply using a multicore cable. Theoretically there is no limit as to the number of printers which may be coupled to form a subsystem but the preferred embodiment, for convenience, comprises subsystems of 4 printers each. In the preferred embodiment, the subsystems are coupled together in a daisy chain manner. That is to say, the subsystems 10 are coupled together to receive the clock pulse and regenerate the signal to the adjacent subsystems 10. The clock pulse is then supplied simultaneously to each printer 14.

The master clock also incorporates an audible and visible system failure alarm 16 which is activated if the time signal output into the network is not returned within a pre-determined time - ie. if the daisy chain is broken. However, the system can operate without an alarm and the time signal need not be returned to the master clock.

As shown in Figure 5 each printer 14 includes an LCD display 18 for indicating time, transaction number or status messages; a dot matrix printer 20 for printing the time and date and other relevant information; a microprocessor 22 for co-ordinating the various functions of the printer; a crystal oscillator 24 as a local back-up time source and at least two input/output ports 25 for enabling a real time clock PCB to be coupled thereto for use in a 'stand alone' configuration see figure 3.

Each printer also includes 16 DIL switches (not shown) via two input/output ports, 12 of which enable coding of a 3-digit dealer position number and the other 4 can be used to select baud rates, upper/lower case characters or the presence or absence of seconds in the print. The data printed can be amended via software changes to print not just the time and date to the nearest second but also for example a dealer position,

sequential number or abbreviated company name.

If the networked time signal is unavailable for any reason there is the in-built time crystal oscillator 24 in the circuitry of each printer takes over the time code generation using the last central update received as a reference point.

Naturally, the printer incorporates means for driving the print head 32, solenoid 34, motor 36, sensors 38, 40 for detecting the presence of paper and position of the print head. Preferably, the printer also includes means for confirming its operational status on power up and means for indicating and isolating failures and the subsequent display 18 thereof.

Each power supply unit includes an interface 26 (RS232 or RS422 in the preferred embodiment) which receives and transmits the networked time signal to the subsystems. Output ports can be incorporated in the subsystems thereby enabling it to register its activities and communicate them back to the master clock, where a central memory 28 would hold the data for later transmission via a separate RS232 port.

The system shown in Figure 2 differs from that shown in figure 1 only in that each of the printers are

coupled in a daisy chain rather than the subsystems. In this embodiment, the RS232/422 interfaces and buffers are incorporated within the printers for enabling the networked time signal to be daisy-chained via the printers.

The embodiment shown in Figure 3 comprises a 'standalone' embodiment, wherein the printers are not networked together but they each individually incorporate an accurate time signal reception via radio, data or telephone lines 30. The source of the incoming time data is the same for all the 'standalone' printers so the targets of accuracy and consistency will still be achieved. The power source could either be an integral part of the printer or remain separate. If the standalone system is also portable, then it would require adequate portable power and a small atomic clock receiver similar to those in use for small mantlepiece timeclocks or other similar radio transmissions.

The third embodiment could also incorporate the following in a variety of combinations: -

- A printer capable of fast, accurate printing of time and date information together with other details. It may also be capable of printing barcoded data with optional encryption for security

purposes.

- The optional addition of a suitable interface to receive an external synchronising time signal via radio transmission, telephone line or data line.

- A label feed with suitable adhesive backing. The adhesive would enable the label to be easily removed from its paper backing.

- The ink used might be indelible.

These variations of the third embodiment would have uses in a number of business applications. The most obvious is for the marking of electrical and electronic goods to identify the beginning of warranty periods. A problem with warranties is identifying the returned goods as bona-fide warranty returns. The best record available may well be just a serial number. Unscrupulous companies or individuals could switch serial number plates or replace new, working circuit boards with faulty circuit boards and return them within an enclosure whose serial number indicates the equipment is still within a warranty period.

The manufacturer and seller of a circuit board, electrical or electronic goods could place a dated,

encoded sticker on the reverse of the circuit boards and on the enclosure to designate the commencement date of the warranty. This sticker would have to have most of the following features to avoid fraudulent activity: -

1. A time and date of application to the board or equipment which cannot be set manually by the operator - ideally provided from an external source to maintain accuracy. This marks the beginning of the warranty period.

2. Encryption of crucial data into a bar-code thus ensuring that the 'warranty-date' sticker cannot be over-printed or hidden. This data could be verified on return to the manufacturers or sellers workshop.

3. The adhesive would have a very strong bond to plastics or other materials (other than paper) so that any effort to remove the 'warranty-date' sticker would lift the tracking on a circuit board and render the board faulty and in breach of warranty conditions.

4. The ink used should be indelible so that it cannot be erased and re-printed to suit a fraudulent operator.

Clearly any equipment returned under warranty would

be checked to ensure that the original 'warranty-date' stickers are intact on both the enclosure and circuit boards and that the encryption has not been tampered with.

This system might also help manufacturers not only to save servicing costs but also accurately identify machines, circuit boards, or distributors which are causing above-abverage returns under warranty.

All of these embodiments will create a user-friendly maintenance enviroment which will allow the operator/customer to identify and solve some problems for themselves, i.e. identify a faulty unit and disconnect it from the system (bypassing it), thus allowing the operator to continue while awaiting an engineer.

The aforegoing description has been given by way of example only and a person skilled in the art would readily acknowledge that modifications may be made without departing fromthe scope of the present invention.

CLAIMS

1. A system for printing the time and date comprising in combination:

a single means for generating an electronic clock pulse;

one or more power supplies each coupled to said clock pulse generating means; and

one or more print means each coupled to one of said power supplies.

2. A system as claimed in claim 1, in which each power supply and the print means coupled thereto form subsystems.

3. A system as claimed in claim 2, in which each of said subsystems are coupled in a daisy chain.

4. A system as claimed in claim 1, in which each of said print means are coupled in a daisy chain.

5. A system as claimed in any one of the preceding claims, further comprising a first back-up supply for each power supply and a further back-up supply for said generating means.

6. A system as claimed in any one of claims 1 to 5, in

which said generating means is sited remote from any of said print means for enabling access to said generating means to be controlled.

7. A system as claimed in any one of the preceding claims in which said electronic clock pulse includes seasonal adjustments.

8. A system as claimed in any one of the preceding claims, in which said master clock includes a receiver for receiving radio transmissions from an atomic clock course.

9. A system substantially as hereinbefore described with reference to any one of the accompanying figures.

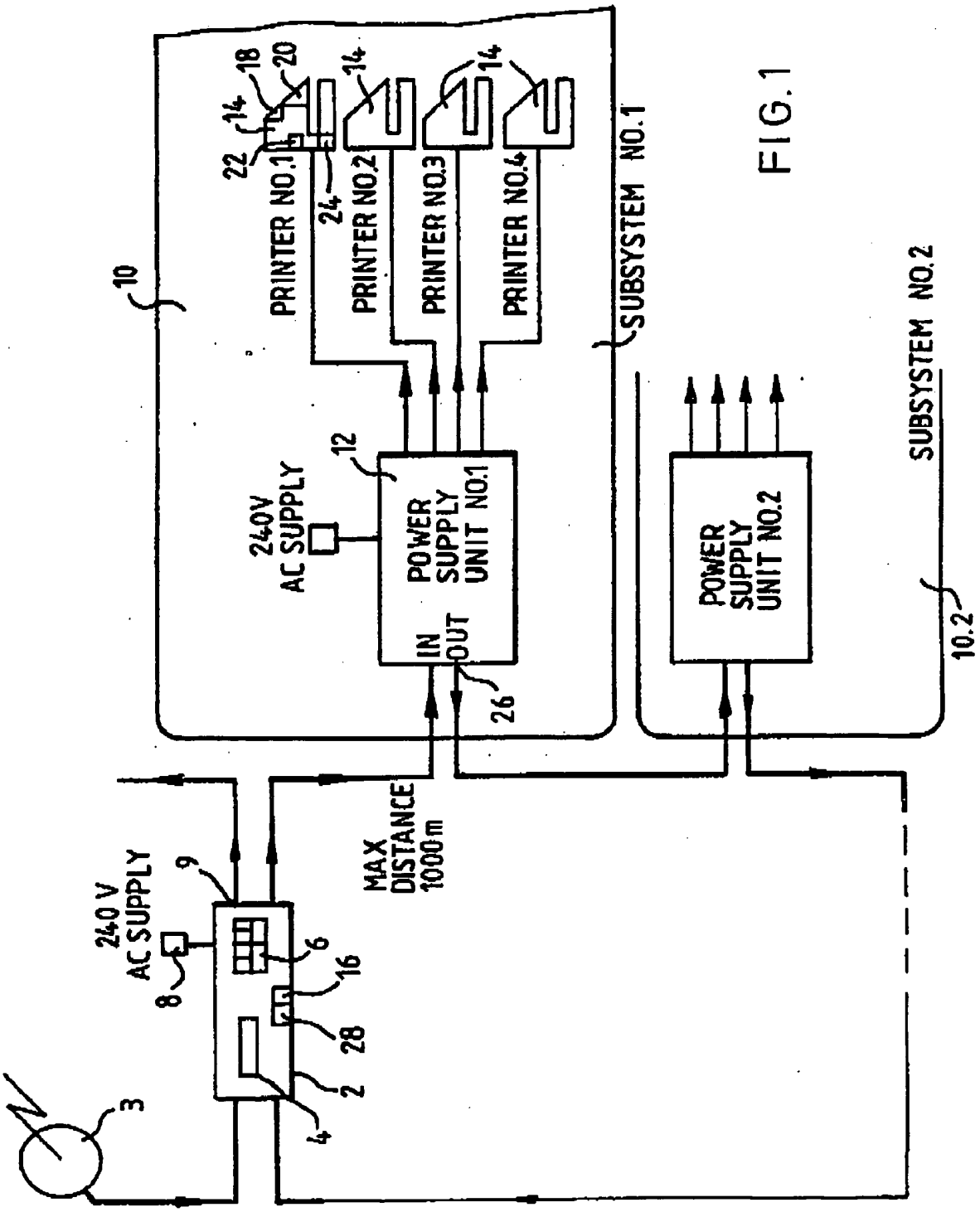

FIG. 1

PAGE 24/38 * RCVD AT 5/12/2004 11:58:33 AM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:208 396 3958 * DURATION (mm-ss):08-18

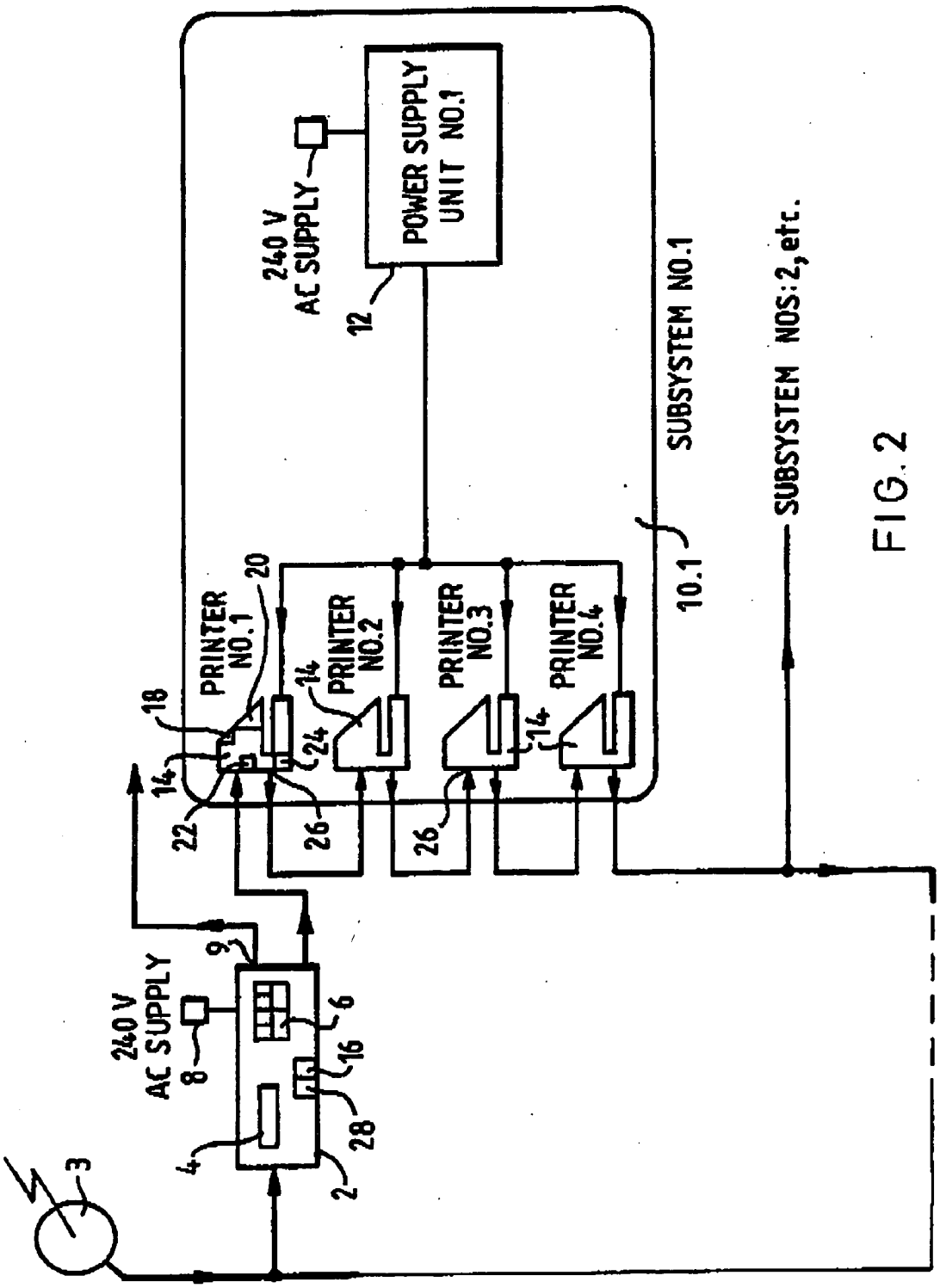

FIG. 2

PAGE 25/38 * RCVD AT 5/12/2004 11:58:33 AM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:208 396 3958 * DURATION (mm-ss):08-18

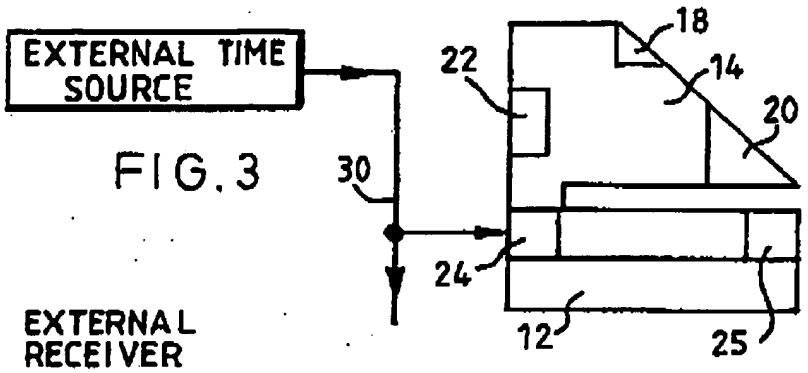

FIG. 3

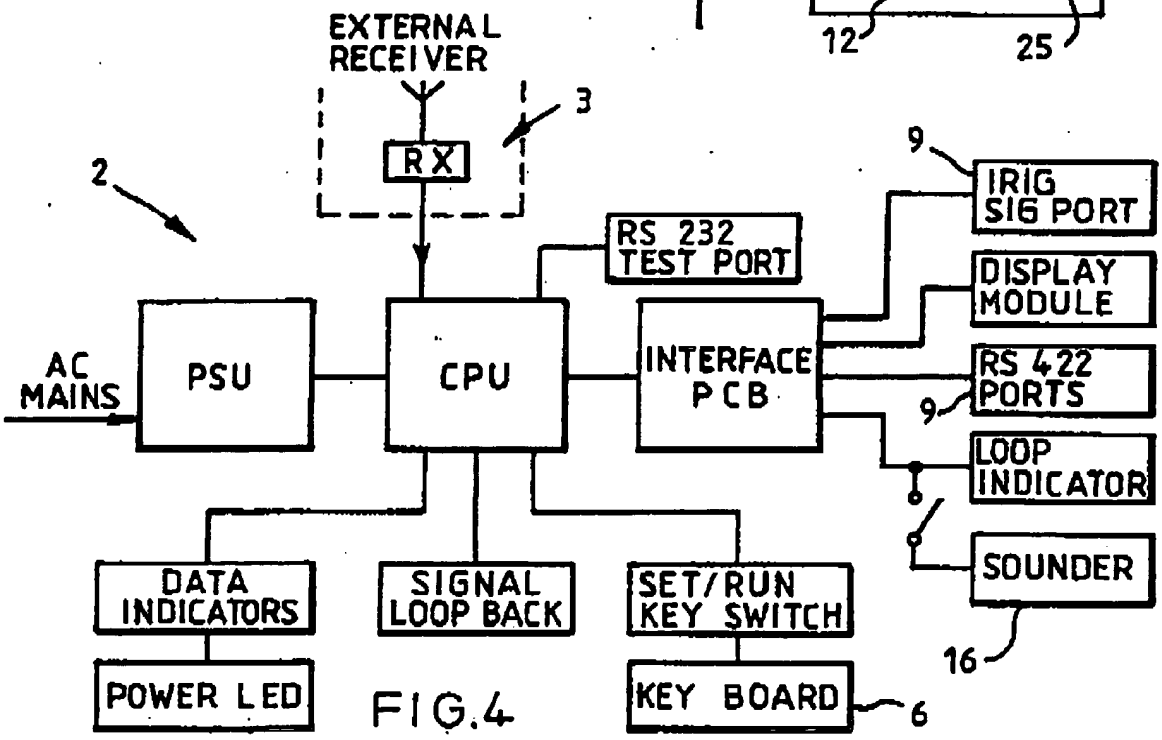

FIG. 4

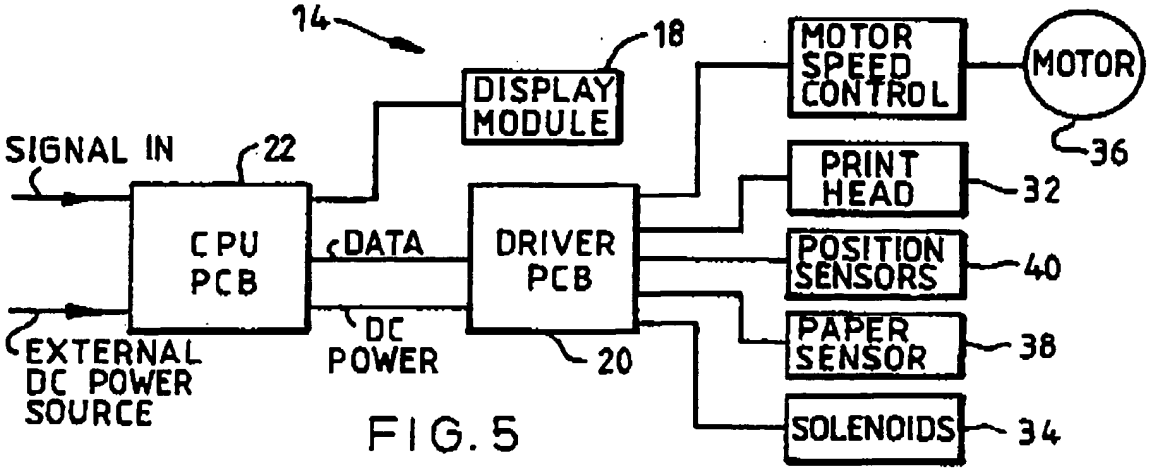

FIG. 5

PAGE 26/38 * RCVD AT 5/12/2004 11:58:33 AM [Eastern Daylight Time] * SVR:USPTO-EFXRF-1/3 * DNIS:8729306 * CSID:208 396 3958 * DURATION (mm-ss):08-18

INTERNATIONAL SEARCH REPORT

PCT/GB 91/00090

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G07C1/08

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G07C ; G07B ; G04G ; B41J

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category[10]	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	HASLER MITTEILLUNGEN. vol. 39, no. 1/2, July 1980, BERN CH pages 16 - 23; MARQUIS: "Zeitverteilung über grosse Distanzen mittels Fernsteuerung von autonomen Uhrenzentralen" see page 17, column 2, line 1 - page 18, column 2, line 26 see page 23, column 2, lines 1 - 18; figures ---	1, 7, 8
A	US,A,4490050 (SINGHI) 25 December 1984 see column 2, line 23 - column 3, line 18; figures ---	1
A	EP,A,0020158 (ITR INTERNATIONAL TIME) 10 December 1980 see page 4, line 15 - page 5, line 3 see page 11, lines 20 - 26; figures ---	1, 5

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
07 MAY 1991	06. 08. 91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	MEYL D.

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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,4150437 (RUSSELL) 17 April 1979 see column 8, lines 4 - 44; figure 5	1
A	GB,A,2071380 (OMRON TATEISI) 16 September 1981 see page 1, lines 70 - 116; figures	1
A	CONTROL ENGINEERING. vol. 19, no. 2, February 1972, NEW YORK US pages 23 - 27; ARONSON: "Production Monitoring Systems: A Hardware Survey" see pages 26 - 27; figures	1-3
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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		US-A-	4401994	30-08-83
DE-A-2424490	04-12-75	None		
GB-A-2141569	19-12-84	None		

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